

Appl. No. 09/730,813
Amendment

LISTING OF CLAIMS

This listing of claims replaces all prior versions and listings of claims in the patent application.

Claim 1 (currently amended): A surface treatment apparatus for making raw material gas plasma by generating plasma, in a casing provided with plasma generation means, a raw material gas inlet and a substrate support table, by the plasma generation means and giving plasma treatment to the surface of a substrate placed on said substrate support table, wherein:

12 said casing is defined into two chambers, a plasma generation chamber provided with said plasma generation means and a substrate treatment chamber provided with said substrate support table;

said substrate treatment chamber and said plasma generation chamber are connected through one or more plasma nozzles;

at least one of said plasma nozzles is made a hollow electrode discharge generation area; and

an opening width $W(1)$ of the smallest portion on the plasma nozzles is set in a range satisfying $10 \text{ mm} < W(1) \leq 100 \text{ mm}$, $W(1) \leq 20X$;

where X is a thickness of a sheath layer generated under the desired plasma generation conditions.

NOTE: In the amendment to claim 1, the equation of $10 \text{ mm} < W(1) \leq 100 \text{ mm}$ includes the symbol \leq which is not underlined because the symbol would be obscured due to underlining.

Claims 2 and 3 (withdrawn)

Claim 4 (cancelled)

Appl. No. 09/730,813
Amendment

Claim 5 (previously amended) A surface treatment apparatus according to claim 1, wherein said plasma nozzle forms a substantially continuous and elongated slit shape that can be drawn with a single stroke of the brush.

Claim 6 (original): A surface treatment apparatus according to claim 5, wherein said plasma nozzle is whorl shaped.

Claim 7 (original): A surface treatment apparatus according to claim 5, wherein said plasma nozzle is meandering shaped.

Claim 8 (original): A surface treatment apparatus according to claim 5, wherein said plasma nozzle is connected straight lines shaped.

DZ
cut
Claim 9 (original): A surface treatment apparatus according to claim 5, wherein said plasma nozzle is formed symmetrically in respect with its center.

Claim 10 (original): A surface treatment apparatus according to claim 5, wherein a slit width W of the plasma nozzle is set in a range satisfying either of $W \leq 5L(e)$ or $W \leq 20X$:

where $L(e)$ is an electron mean free path in respect to atom or molecular species (active species) of the smallest diameter among raw material gas species and electrically neutral atom or molecular species (active species) produced therefrom by decomposition, under the desired plasma generation conditions; and

X is a thickness of a sheath layer generated under the desired plasma generation conditions.

Claim 11 (original): A surface treatment apparatus according to claim 5, wherein said plasma nozzle varies its slit width from a center to an outer circumference thereof.

Claim 12 (original): A surface treatment apparatus according to claim 5, wherein said plasma nozzle varies its slit depth from a center to an outer circumference thereof.

Appl. No. 09/730,813
Amendment

Claims 13-18 (withdrawn)

Claim 19 (previously amended): A surface treatment apparatus of one of claims 1 and 5-12, wherein said apparatus comprises potential applying means for applying a desired potential to the substrate.

2
at

